CITY OF LAVA HOT SPRINGS (PWS 6030030)
SOURCE WATER ASSESSMENT FINAL REPORT

June 4, 2002

State of Idaho
Department of Environmental Quality

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Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This assessment is based on a land use inventory of the designated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

This report, *Source Water Assessment for the City of Lava Hot Springs, Idaho* describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The City of Lava Hot Springs (Public Water System 6030030) is classified as a community water system. The drinking water system consists of two ground water wells, Well #2 W and Well #1 Fish Creek, and eleven springs. The system's springs are not covered in this report and will be attached at a later date to this assessment. The system serves approximately 521 persons through 288 connections.

Final susceptibility scores are derived from system construction scores, hydrologic sensitivity scores, and potential contaminant/land use scores. Potential contaminants are divided into four categories, inorganic contaminants (IOCs, i.e. nitrates, arsenic), volatile organic contaminants (VOCs, i.e. petroleum products), synthetic organic contaminants (SOCs, i.e. pesticides), and microbial contaminants (i.e. bacteria). As different wells can be subject to various contamination settings, separate scores are given for each type of contaminant. In terms of total susceptibility, Well #1 Fish Creek rated high susceptibility to all classes of contaminants and Well #2 W rated moderate for IOCs, SOCs, and microbial contaminants and automatically rated high for VOCs.

For the assessment, a review of laboratory tests was conducted using the Idaho Drinking Water Information Management System (DWIMS) and the State Drinking Water Information System (SDWIS). Total coliform bacteria were detected at various sample locations in the distribution system between September 1996 and April 2001, but no repeat samples were ever confirmed at the wellheads or spring sources. Total coliform bacteria have not been detected in the water system since April 2001. The IOCs barium, fluoride, cyanide, lead, sodium and nitrate have been detected in the drinking water, but at levels below the maximum contaminant level (MCL) for each chemical. In November 2000, January 2001, and April 2001 nitrate levels in Well #2 W were 8.1 milligrams per liter (mg/L), 8.1 mg/L, and 8.7 mg/L, respectively, approaching the MCL of 10 mg/L. Also, the radionuclides (RADs) radium-226, radium-228 and combined uranium were detected at Well #2 W in December 2001 and were below their designated MCL. The VOC tetrachloroethylene was detected in Well #2 W at 0.6 μg/L in November 2001 and was below the MCL of 5 μg/L. No SOCs have been detected in the drinking water.

A sanitary survey was conducted by DEQ for the City of Lava Hot Springs in January 2001. Improvements for Well #1 Fish include replacement of the pressure gauge and a gauge isolation valve should be installed. Well #1 Fish also should be raised to at least 12 inches above the pumphouse floor, sealed to the pump support plate, and an approved casing vent should be installed. Well #2 W should also have an approved well casing vent installed and the floor drain pipe needs repair.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

For the City of Lava Hot Springs, drinking water protection activities should focus on identifying the source of tetrachloroethylene contamination in Well #2 W. If tetrachloroethylene concentrations approach or exceed the MCL, the system should take appropriate measures to treat the water source. Treatments, such as granular activated charcoal and packed tower aeration for VOC contaminants should be investigated to remedy this problem. In addition, drinking water protection activities should focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system's components and its capacity). If microbial problems arise or other chemicals tested approach or exceed the MCL (such as nitrate), the system should take appropriate measures to treat the water source. Well #1 Fish Creek is currently disinfected, but such a system could be installed for Well #2 W. Other treatments, such as reverse osmosis for inorganic chemical contaminants should be investigated if problems arise. Also, any new sources that could be considered potential contaminant sources in the wells' zones of contribution should also be investigated and monitored to prevent future contamination. No potential contaminants (pesticides, paint, fuel, cleaning supplies, etc.) should be stored or applied within 50 feet of the well. The wells should maintain sanitary standards regarding wellhead protection. Land uses within most of the source water assessment area are outside the direct jurisdiction of the City of Lava Hot Springs. Therefore partnerships with state and local agencies, industrial, and commercial groups should be established to ensure future land uses are protective of ground water quality.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include proper lawn and garden care practices, household hazardous waste disposal methods, proper care and maintenance of septic systems, and the importance of water conservation to name but a few. There are multiple resources available to help water systems implement protection programs, including the Drinking Water Academy of the U.S. Environmental Protection Agency. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture and the Bannock County Soil and Water Conversation District. As major transportation corridors intersect the delineations (such as U.S. Route 30), the Idaho Department of Transportation should be involved in protection efforts.

A system must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR CITY OF LAVA HOT SPRINGS, IDAHO

Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are contained in this report. The list of significant potential contaminant source categories and their rankings used to develop this assessment is also attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the wells, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a drinking water protection program should be determined by the local community based on its own needs and limitations. Wellhead or drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Section 2. Conducting the Assessment

General Description of the Source Water Quality

The City of Lava Hot Springs is a community public drinking water system located in Bannock County (Figure 1). This system consists of two ground water wells (Well #1 Fish Creek and Well #2 W) and eleven springs that provides drinking water to approximately 521 persons through approximately 288 connections. This assessment will include the wells. The springs will be assessed and appended at a later date.

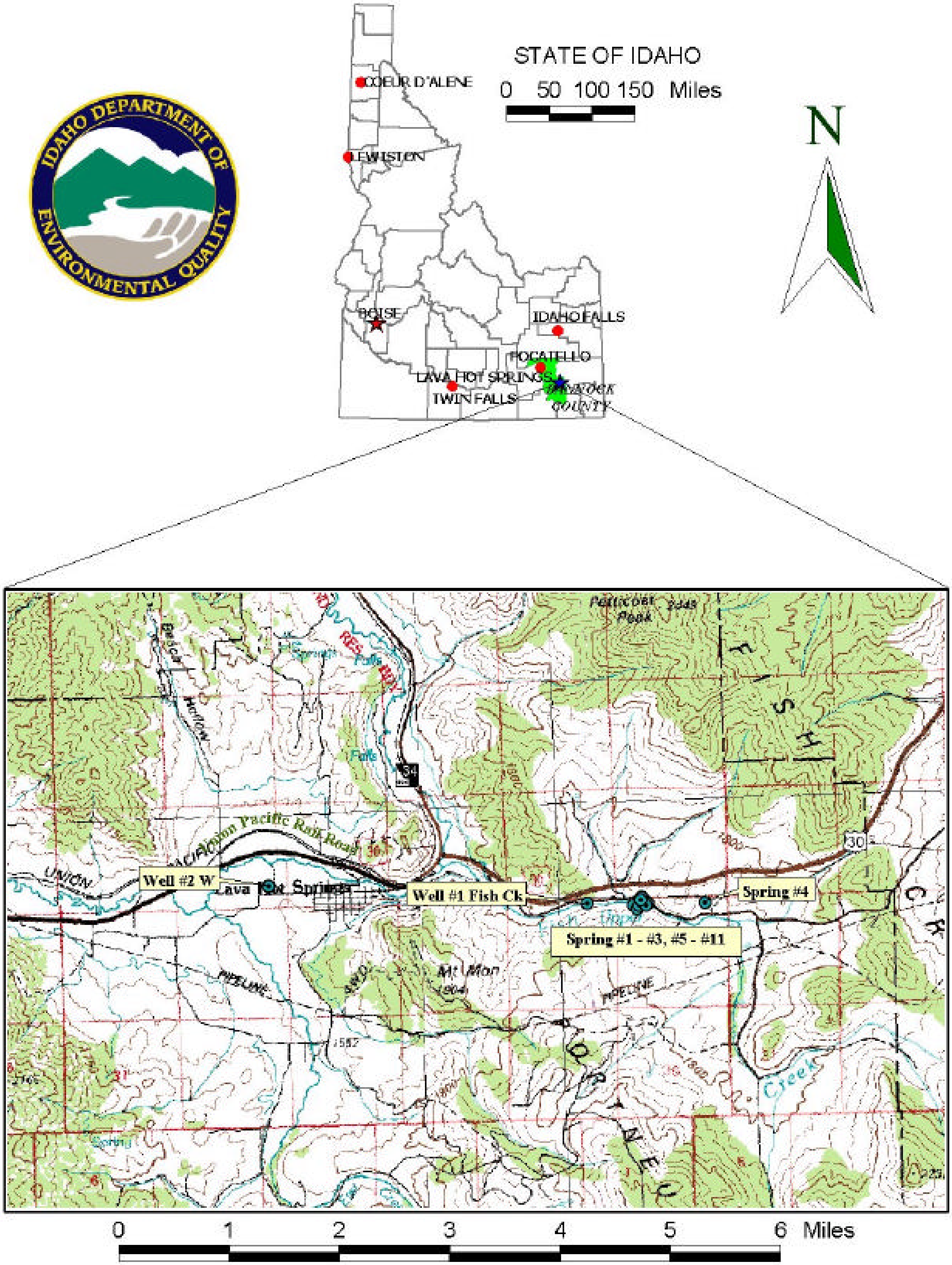
Well #1 Fish Creek is located approximately ½mile downstream of the Fish Creek springs and serves as a secondary source to the springs. The inorganic contaminants (IOCs) barium, fluoride, cyanide, lead, sodium, and nitrate represent the main water chemistry constituents recorded for this well, although the reported concentrations of these chemicals were below the MCL for each chemical, as set by the EPA. Well #2 W is located on a foothill west of the City of Lava Hot Springs. The IOCs barium, fluoride, nitrate, and sodium has been detected at this well. In November 2000, January 2001, and April 2001 nitrate levels in Well #2 W were 8.1 milligrams per liter (mg/L), 8.1 mg/L, and 8.7 mg/L, respectively, approaching the MCL of 10 mg/L. The radionuclides (RADs) detected Well #2 W during December 2001 were radium-226, radium-228, and combined uranium, all of which were below their designated MCL. Additionally, in November 2001 the volatile organic contaminant (VOC) tetrachloroethylene was detected in Well #2 W at 0.6 micrograms per liter (µg/L) and was below the MCL of 5 µg/L. No SOCs have been detected in the drinking water system.

Total coliform bacteria were detected between September 1996 and April 2001 at various sample locations in the distribution system. None of these detects were found at the wellhead or spring locations. Since April 2001, total coliform bacteria have not been detected in the water system.

Defining the Zones of Contribution--Delineation

The delineation process establishes the physical area around a well or spring that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel zones (zones indicating the number of years necessary for a particle of water to reach a pumping well) for water in the aquifer. Washington Group International (WGI) was contracted by DEQ to define the public water system's zones of contribution. WGI used a calculated fixed radius model approved by the Source Water Assessment Plan (DEQ, 1999) in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) Time-of-Travel (TOT) zones for water associated with the Portneuf Valley – Gem Valley hydrologic province in the vicinity of the City of Lava Hot Springs. The computer model used site specific data, assimilated by WGI from a variety of sources including operator records and hydrogeologic reports. A summary of the hydrogeologic information from WGI is provided below.

FIGURE 1 - Geographic Location of the City of Lava Hot Springs, PWS 6030030, Well #1 Fish Ck & Well #2 W



The Portneuf Valley – Gem Valley hydrologic province occupies approximately 211 square miles east of Pocatello, Idaho. The Basin and Range physiographic province is north to south trending and is bounded by the Wasatch, Chesterfield, and Portneuf mountain ranges to the southeast, east, and west, respectively. Average annual precipitation ranges from less than 15 inches on the valley floor near Bancroft to 35 inches in the mountains (Norvitch and Larson, 1970, p. 8). The average total depth for 26 wells in the Lava Hot Springs area is 188 feet, and the average depth to water is 83 feet (Baldwin, 2001).

The Portneuf and Gem valley floors consist of Quaternary alluvium, Quaternary olivine basalt flows, and sedimentary rocks of the Tertiary Salt Lake Formation (Norvitch and Larson, 1970, Figures 5 and 6, and Norton, 1981, p. 9). The basalt flows overlie and interfinger sediment deposits in the main portion of the province (Dion, 1969, p. 16). The basalts were extruded from cones and fissures near Alexander and between Niter and the Grace power plant and the Blackfoot Lava Field (Norton, 1981, p. 10). A surface geologic map of the Portneuf River Basin (Norvitch and Larson, 1970, p. 14) indicates that the western arm of the province is composed primarily of Quaternary alluvial deposits and Tertiary sedimentary rock outcrops. Ground water occurs in virtually every geologic unit; however, the principal aquifer is basalt. A broad northwest trending mound of water forms a ground water divide in the basalt aquifer at the southern margin of the province (Dion, 1969, p. 19 and Figure 5, and Norton, 1981, Figure 5). Water north of the divide flows to the Snake River, and water south of the divide flows to the Bear River drainage that empties into the Great Salt Lake in Utah. Available water table maps indicate that the general ground water flow direction in the study area is to the Portneuf River, a tributary of the Snake River (Norvitch and Larson, 1970, p. 17, and Norton, 1981, p.15).

The primary source of ground water recharge to the basalt aquifer is precipitation on the valley floor and the surrounding mountains. Other sources are underflow from the Soda Springs hydrologic province through the gap at Soda Point and at Tenmile Pass, percolation from irrigation, canal leakage, and stream losses (Norton, 1981, p. 11, and Dion, 1974, p.19). The primary ground water discharge mechanisms are evapotranspiration, discharge through hundreds of springs and seeps, pumpage from wells, and underflow through the Portneuf Gap (Norton, 1981, p. 11; Norvitch and Larson, 1970, p 18; and Dion, 1969, p. 19).

There is little usable information available on the direction of ground water flow in the alluvial and sedimentary rock aquifers. Flow in the alluvial aquifer located in the western arm of the province can be assumed to follow the Portneuf River and have roughly the same gradient as the surface topography. Making the same assumptions for the sedimentary rock aquifer is not reasonable. The folded and fractured sedimentary rocks that underlie the Portneuf and Gem valleys also make up the bulk of the surrounding mountains. Water moving through these formations tends to follow bedding planes that pass under mountain ridges. Consequently, the flow may cross topographic divides and discharge to a valley different from that of the recharge area (Ralston et al., 1979, pp. 128-129).

The calculated fixed-radius method was used to delineate capture zones for Public Water System (PWS) wells completed in the sedimentary rock aquifer within the Portneuf Valley – Gem Valley hydrologic province. The fixed radii for the 3-, 6-, and 10-year capture zones were calculated using equations presented by Keely and Tsang (1983) for the velocity distribution surrounding a pumping well. The City of Lava Hot Springs wells are completed or assumed to be completed in limestone and sandstone, based on the driller's logs and/or proximity to wells of known completion and similar depth.

The assumed pumping rate for Well #1 is the same as the average daily rate of Well #2 because no other production data are available. The hydraulic conductivity is the geometric mean of estimates derived from analysis of specific capacity data for wells completed in basalt (Norvitch and Larson, 1970; pp. 25-30) using the method of Walton (1962, p. 12). The effective porosity (0.2) and uniform hydraulic gradient (0.003) are the default values presented in Table F-3 of the Idaho Wellhead Protection Plan for mixed volcanic and sedimentary rocks, primarily sedimentary rocks (IDEQ, 1997, p. F-6). The aquifer thickness is the saturated open interval of the City of Lava Hot Springs Well #1.

Fixed-radius calculations resulted in radial distances ranging from 386 to 723 feet for the 3-year TOTs. The 10-year distance is 1,565 feet for both wells in the City of Lava Hot Springs. The total area including the 3-, 6-, and 10-year capture zones is 0.28 square mile for both wells in the City of Lava Hot Springs (Figures 2 & 3 in Attachment A). The actual data used by WGI in determining the source water assessment delineation areas are available from DEQ upon request.

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act. Furthermore, these sources have a sufficient likelihood of releasing such contaminants into the environment at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Field surveys conducted by DEQ and reviews of available databases identified potential contaminant sources within the delineation areas.

It is important to understand that a release may never occur from a potential source of contamination provided best management practices are used at the facility. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, such as educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply well.

Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted during February of 2002. The first phase involved identifying and documenting potential contaminant sources within the City of Lava Hot Springs source water assessment areas through the use of computer databases and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator, Tony Hobson to validate the sources identified in phase one and to add any additional potential sources in the area. At the time of the enhanced inventory, the dimensions of the municipal wastewater land application site were clarified. Maps with well locations, delineated areas, and potential contaminant sources are provided with this report (Attachment A). Each potential contaminant source has been given a unique site number that references tabular information associated with the public water wells (Tables 1 to 2).

Table 1. City of Lava Hot Springs, Potential Contaminant Inventory for Well #1 Fish Creek

Site #	Source Description[1]	TOT Zone (years)[2]	Source of Information	Potential Contaminants[3]
	Fish Creek	0-10	GIS Map	IOC, VOC, SOC, Microbes
	Fish Creek Road	0-10	GIS Map	IOC, VOC, SOC, Microbes
	U.S. Route 30	0-10	GIS Map	IOC, VOC, SOC, Microbes

[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Table 2. City of Lava Hot Springs, Potential Contaminant Inventory for Well #2 W

Site #	Source Description[1]	TOT Zone (years)[2]	Source of Information	Potential Contaminants[3]
1, 4	Wastewater Land Application Site	3-10	Database Search	IOC, Microbes
2	Above ground storage tank – historic	3-6	Enhanced Inventory	VOC, SOC
3	NPDES - Municipal	6-10	Database Search	IOC, Microbes
	Portneuf River	6-10	GIS Map	IOC, VOC, SOC

[1] NPDES = National Pollutant Discharge and Elimination System
[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Section 3. Susceptibility Analyses

Each source's susceptibility to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic characteristics, system construction of the well, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each source is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Attachment B contains the susceptibility analysis worksheets. The following summaries describe the rationale for the susceptibility ranking.

Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors. These factors are surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone above the water producing zone of the well. Slowly draining soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet from the surface protect the ground water from contamination.

Hydrologic sensitivity was rated high for Well #1 Fish Creek and moderate for Well #2 W (Table 3). Regional soils classifications within the delineated zones show a majority of moderate to well drained soils. The Well #2 W log showed that the well had a vadose zone composed of a combination of clay, sand, and gravel. Ground water was first encountered in Well #2 W at greater than 300 feet below ground surface (bgs). The log also showed that there were numerous clay layers totaling about 50 feet in thickness. No well log information was available for Well #1 Fish Creek, preventing evaluation of the above factors.

Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system that can better protect the water. If the casing and annular seal both extend into a low permeability unit then the possibility of cross contamination from other aquifer layers is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capabilities. When information was adequate, a determination was made as to whether the casing and annular seals extend into low permeability units and whether current public water system construction standards are met.

A sanitary survey was completed in 2001. The sanitary survey indicates that Well #1 Fish Creek had an inoperative pressure gauge and it could not be determined where the exit pipe reached the creek or whether it was screened. Due to wildlife, pooling of water was observed near the pipe. In addition, it was recommended that the casing be raised to at least 12 inches above the pumphouse floor to prevent the possibility of surface flooding. Well #2 W was in need of a downturned, screened, casing vent and the pipe connected to the floor drain was in need of repair. The system construction scores were high for Well #1 Fish Creek and moderate for Well #2 W.

Well #1 Fish Creek was constructed in the 1950s with 16-inch steel casing. The total depth of the casing is estimated to be 300 feet bgs. No other well construction information is available. Because the well is located up Fish Creek Canyon in the Portneuf Range, it is assumed to be completed in the limestone and/or sandstone that make up the bulk of the range. The average well production is unknown.

Well #2 W, completed in 1991, was drilled to a depth of 560 feet bgs. 0.250-inch thick, 16- and 10-inch diameter steel casing was installed to a depth of 505 feet into broken limestone and sandstone and was perforated from 303 to 343, 363 to 403, and 443 to 483 feet bgs. The annular seal was placed to 35 feet bgs into "soft brown clay." The placement of the casing and annular seal into non-producing low permeability layers lowered the system construction score for Well #2 W. The average pumping rate is 115,260 gallons per day according to the owner/operator.

The Idaho Department of Water Resources (IDWR) *Well Construction Standards Rules (1993)* require all public water systems (PWSs) to follow DEQ standards. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works (1997)* during construction. Under current standards, all PWS wells are required to have a 50-foot buffer around the wellhead and if the well is designed to yield greater than 50 gallons per minute (gpm) a minimum of a 6-hour pump test is required. These standards are used to rate the system construction for the well by evaluating items such as condition of wellhead and surface seal, whether the casing and annular space is within consolidated material or 18 feet below the surface, the thickness of the casing, etc. If all criteria are not met, the public water source does not meet the IDWR Well Construction Standards. In this case, there was insufficient information available to determine if the wells met all the criteria outlined in the IDWR Well Construction Standards.

Potential Contaminant Source and Land Use

The potential contaminant sources and land use within the delineated zones of water contribution are assessed to determine the well's susceptibility. When agriculture is the predominant land use in the area, this may increase the likelihood of agricultural water infiltrating into the ground water system. Agricultural land is counted as a source of leachable contaminants and points are assigned to this rating based on the percentage of agricultural land. The predominant land use within the delineated capture zones of the City of Lava Hot Springs is irrigated agricultural land. Most of the potential contaminant sources fall within the 6- and 10-year TOT zones (see Tables 1-3 and Figures 2-4).

In terms of potential contaminant sources and land use susceptibility the ratings are as follows. Well #1 Fish Creek rated high for IOCs (i.e., nitrates), moderate for VOCs (i.e. petroleum related products), and SOCs (i.e., pesticides) and microbial contaminants (i.e., fecal coliform). Well #2 W rated moderate for IOCs, VOCs, and SOCs, and low for microbial contaminants.

Final Susceptibility Rating

A detection above an inorganic drinking water standard (MCL), a bacterial detection at the wellhead, any detection of a VOC or SOC, or having potential contaminant sources within 50 feet of the wellhead will automatically give a high susceptibility rating to the final well ranking despite the land use of the area because a pathway for contamination already exists. In this case, Well #2 W automatically rated high for VOCs due to the detection of tetrachloroethylene in November 2001. Hydrologic sensitivity and system construction scores are heavily weighted in the final scores. Having multiple potential contaminant sources in the 0 to 3-year TOT zone (Zone 1B) and a large percentage of agricultural land contribute greatly to the overall ranking. The final susceptibility ranking for Well #1 Fish Creek were high for all classes of contaminants. Well #2 W rated moderate for IOCs, SOCs, and microbial contaminants. These ratings reflect the hydrologic sensitivity, system construction, and potential contaminants inventory and land use within the delineated source water assessment areas for the well.

Table 3. Summary of City of Lava Hot Springs Susceptibility Evaluation

Drinking Water Source	Susceptibility Scores									
	Hydrologic Sensitivity	Contaminant Inventory				System Construction	Final Susceptibility Ranking			
		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Well #1 Fish Creek	H	H	M	M	M	H	H	H	H	H
Well #2 W	M	M	M	M	L	M	M	H*	M	M

H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility

IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

H* = Automatic rating of high due to VOC found at the wellhead location.

Susceptibility Summary

The overall susceptibility was high Well #1 Fish Creek and moderate for Well #2 W, except that Well #2 W automatically rated high for VOCs due to the detection of tetrachloroethylene in November 2001. These scores were influenced by the potential contaminant sources within the delineated areas, as well as the composition of the vadose zone (low permeability clays). More information regarding well construction is needed to properly assess Well #1 Fish Creek, therefore, the well received a higher susceptibility rating. The IOCs barium, fluoride, cyanide, lead, sodium, and nitrate represent the main water chemistry constituents recorded in the public water system, although the reported concentrations of these chemicals were below the MCL for each chemical, as set by the EPA. The reported detections for nitrate in Well #2 W exceed the active level (meets or exceed half the MCL) and is approaching the MCL of 10 mg/L. The VOC, tetrachloroethylene was detected in Well #2 W in November 2001 at 0.6 µg/L, but is below the MCL of 5 µg/L. Total coliform bacteria were detected at various sample locations in the distribution system. There have been no detections of total coliform bacteria in the system since April 2001. Water chemistry tests have not detected SOCs in the drinking water.

Section 4. Options for Drinking Water Protection

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed drinking water protection program will incorporate many strategies. For the City of Lava Hot Springs, drinking water protection activities should focus on correcting any deficiencies outlined in the sanitary survey. If microbial problems arise or other chemicals tested approach or exceed the MCL (such as nitrate), the system should take appropriate measures to treat the water source. If the VOC, tetrachlorethylene continues to be found in Well #2 W, the system should look into appropriate remediation efforts. If tetrachloroethylene concentrations approach or exceed the MCL, the system should take appropriate measures to treat the water source. Treatments, such as granular activated charcoal and packed tower aeration for VOC contaminants should be investigated to remedy this problem. Treatments, such as disinfectant and filtration for bacterial contamination and reverse osmosis for inorganic chemical contaminants should be investigated to remedy these problems. Also, any new sources that could be considered potential contaminant sources in the well's zones of contribution should also be investigated and monitored to prevent future contamination. No potential contaminants (pesticides, paint, fuel, cleaning supplies, etc.) should be stored or applied within 50 feet of the well. The wells should maintain sanitary standards regarding wellhead protection. Land uses within most of the source water assessment area are outside the direct jurisdiction of the City of Lava Hot Springs. Therefore partnerships with state and local agencies, industrial, and commercial groups should be established to ensure future land uses are protective of ground water quality.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include proper lawn and garden care practices, household hazardous waste disposal methods, proper care and maintenance of septic systems, and the importance of water conservation to name but a few. There are multiple resources available to help water systems implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture and the Bannock County Soil and Water Conversation District. As major transportation corridors intersect the delineations (such as U.S. Route 30), the Idaho Department of Transportation should be involved in protection efforts.

A system must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the DEQ or the Idaho Rural Water Association.

Assistance

Public water supplies and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

DEQ Pocatello Regional Office	(208) 236-6160
DEQ State Office	(208) 373-0502

Website: http://www.deq.state.id.us

Water suppliers serving fewer than 10,000 persons may contact Ms. Melinda Harper, Idaho Rural Water Association, at 208-343-7001 (mailto:mlharper@idahoruralwater.com) for assistance with drinking water protection (formerly wellhead protection) strategies.

References Cited

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POTENTIAL CONTAMINANT INVENTORY
LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ASuperfund≅ is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100-year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5 mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RCRA – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

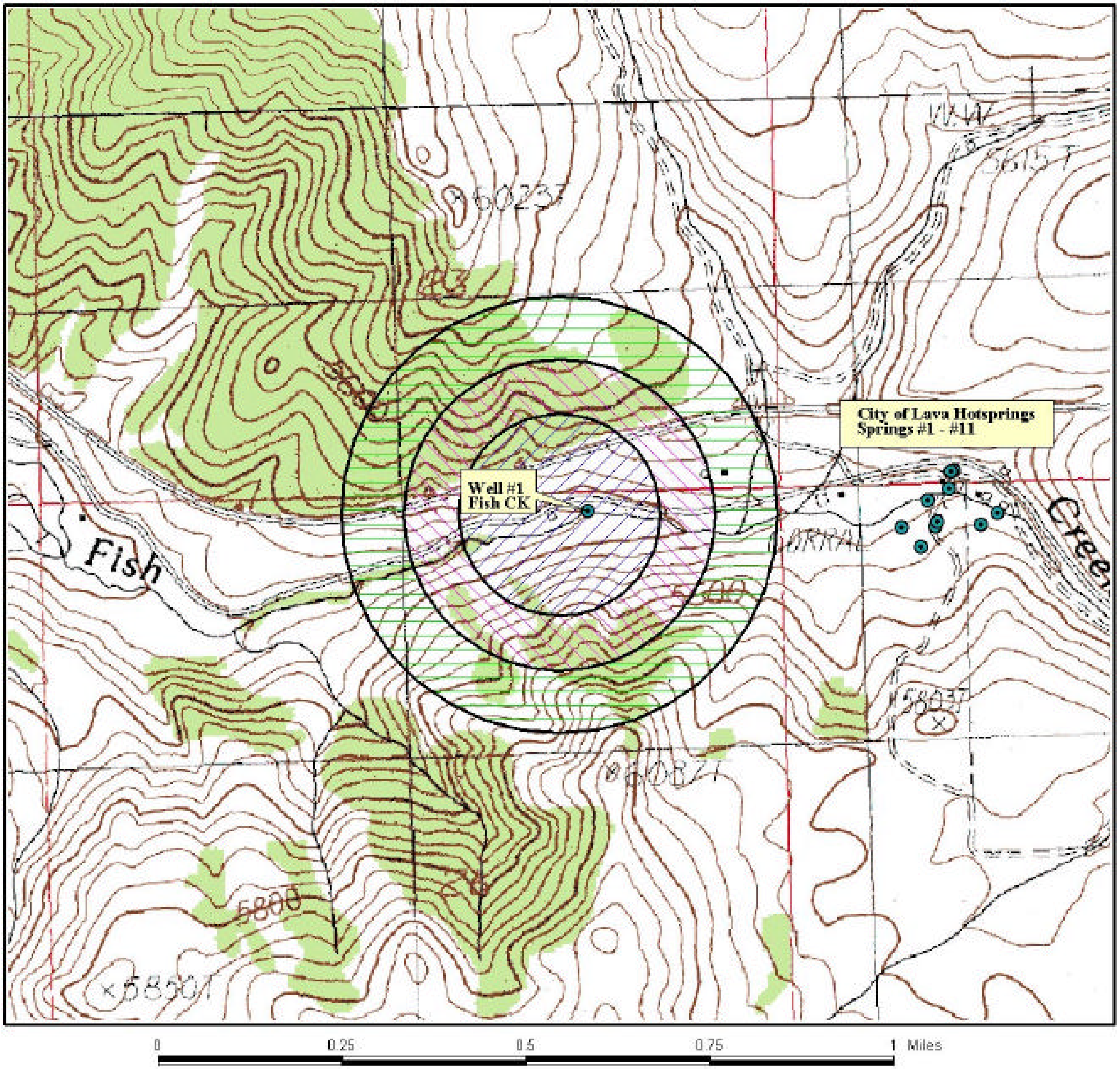
Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

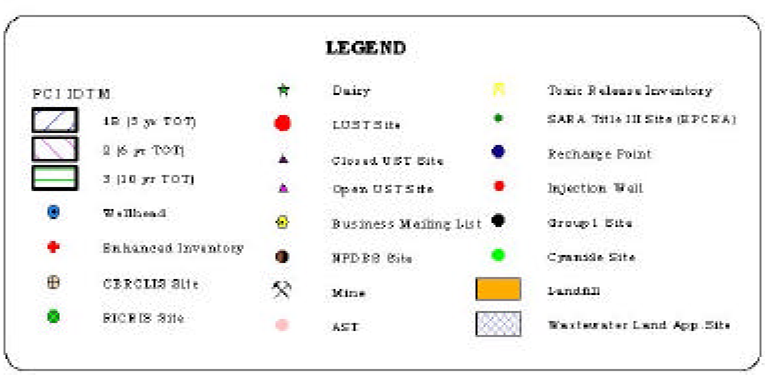
NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Attachment A

City of Lava Hot Springs
Delineation Figures

FIGURE 2 - City of Lava Hot SpringsDelineation Map and Potential Contaminant Source Locations

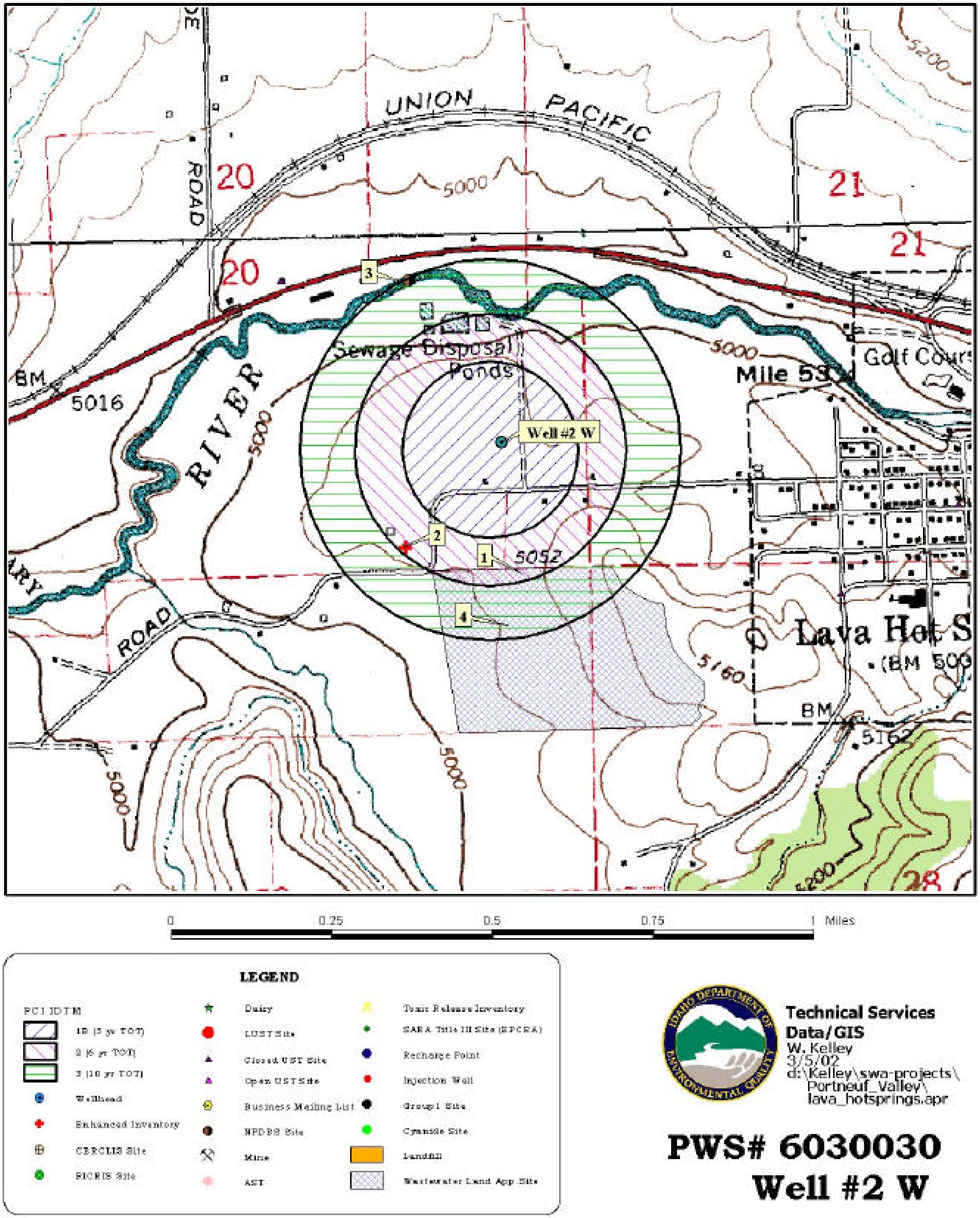




Technical Services Data/GIS
W. Kelley
2/12/02
d:\Kelley\swa-projects\Portneuf_Valley\lava_hotsprings.apr

PWS# 6030030
Well #1 Fish Ck

FIGURE 3 - City of Lava Hot SpringsDelineation Map and Potential Contaminant Source Locations



Technical Services Data/GIS
W. Kelley
3/5/02
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PWS# 6030030
Well #2 W

Attachment B

City of Lava Hot Springs
Susceptibility Analysis Worksheets

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)

2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.35)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

≥ 13 High Susceptibility

Ground Water Susceptibility Report — Public Water System Name : LAVA HOT SPRINGS CITY OF — Well# : WELL #1 FISH CK

Public Water System Number 6030030 — 04/11/2002 7:30:10 AM

1. System Construction

		SCORE
Drill Date	1950s	
Driller Log Available	NO	
Sanitary Survey (if yes, indicate date of last survey)	YES	2001
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	YES	0
Casing and annular seal extend to low permeability unit	NO	2
Highest production 100 feet below static water level	NO	1
Well protected from surface flooding	NO	1
Total System Construction Score		5

2. Hydrologic Sensitivity

Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	YES	1
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	NO	2
Total Hydrologic Score		6

3. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED PASTURE	1	1	1	1
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		1	1	1	1

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	3	3	3	3
(Score = # Sources X 2) 8 Points Maximum		6	6	6	6
Sources of Class II or III leacheable contaminants or	YES	7	3	3	
4 Points Maximum		4	3	3	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4
Total Potential Contaminant Source / Land Use Score - Zone 1B		14	13	13	10

Potential Contaminant / Land Use - ZONE II

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	25 to 50% Irrigated Agricultural Land	1	1	1	
Potential Contaminant Source / Land Use Score - Zone II		4	4	4	0

Potential Contaminant / Land Use - ZONE III

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Source Present	YES	1	1	1	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone III		2	2	2	0
Cumulative Potential Contaminant / Land Use Score		21	20	20	11

4. Final Susceptibility Source Score	15	15	15	14
5. Final Well Ranking	High	High	High	High

Ground Water Susceptibility Report   Public Water System Name : LAVA HOT SPRINGS CITY OF   Well# : WELL #2 W
Public Water System Number 6030030   05/01/2002 8:00:48 AM

1. System Construction		SCORE
Drill Date	09/13/1991	
Driller Log Available	YES	
Sanitary Survey (if yes, indicate date of last survey)	YES	2001
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	NO	1
Casing and annular seal extend to low permeability unit	NO	2
Highest production 100 feet below static water level	YES	0
Well protected from surface flooding	YES	0
	Total System Construction Score	4

2. Hydrologic Sensitivity		
Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	NO	0
Depth to first water > 300 feet	YES	0
Aquitard present with > 50 feet cumulative thickness	YES	0
	Total Hydrologic Score	2

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED CROPLAND	2	2	2	2
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES	NO	YES	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	2	2
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	NO	0	0	0	0
(Score = # Sources X 2) 8 Points Maximum		0	0	0	0
Sources of Class II or III leacheable contaminants or	YES	4	0	0	
4 Points Maximum		4	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4
Total Potential Contaminant Source / Land Use Score - Zone 1B		8	4	4	4
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Greater Than 50% Irrigated Agricultural Land	2	2	2	
Potential Contaminant Source / Land Use Score - Zone II		5	5	5	0
Potential Contaminant / Land Use - ZONE III					
Contaminant Source Present	YES	1	1	1	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Is there irrigated agricultural lands that occupy > 50% of	YES	1	1	1	
Total Potential Contaminant Source / Land Use Score - Zone III		3	3	3	0
Cumulative Potential Contaminant / Land Use Score		18	14	14	6

4. Final Susceptibility Source Score	10	9	9	8
5. Final Well Ranking	Moderate	High*	Moderate	Moderate